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CrawfordSchools

PRELIMINARY EXAMINATION

MATHEMATICS PAPER 2

SEPTEMBER 2020

MARKS : 150

DURATION : 3 HOURS

Name of Candidate	
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Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	TOTAL
7	17	22	6	9	8	8	7	13	6	11	13	10	13	150

INSTRUCTIONS

1. This question paper consists of 30 pages and an Information Sheet of 2 pages. Please check that your paper is complete.
 2. Read the questions **carefully**.
 3. Answer all questions on the question paper.
 4. Extra space is provided at the end of the paper, should this be necessary.
 5. Diagrams are not necessarily drawn to scale.
 6. You may use an **approved non-programmable and non-graphical calculator**.
 7. Round off to **one** decimal place, unless specified otherwise.
 8. Ensure that your calculator is in **DEGREE** mode.
 9. All necessary working details must be clearly shown.
 10. Give reasons for statements, unless specified otherwise.
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SECTION A**QUESTION 1**

The owner of *Pizza Perfect* uses the following set of data to illustrate the relationship between the number of people who visited two different restaurants over a period of 6 days.

Dino's Pizzeria (x)	12	14	17	21	26	30
Papachinos (y)	60	70	70	100	100	120

Round your answers off to two decimal places.

- (1) Determine the equation of the least squares line for the given data. (2)

- (2) Calculate the correlation coefficient. (1)

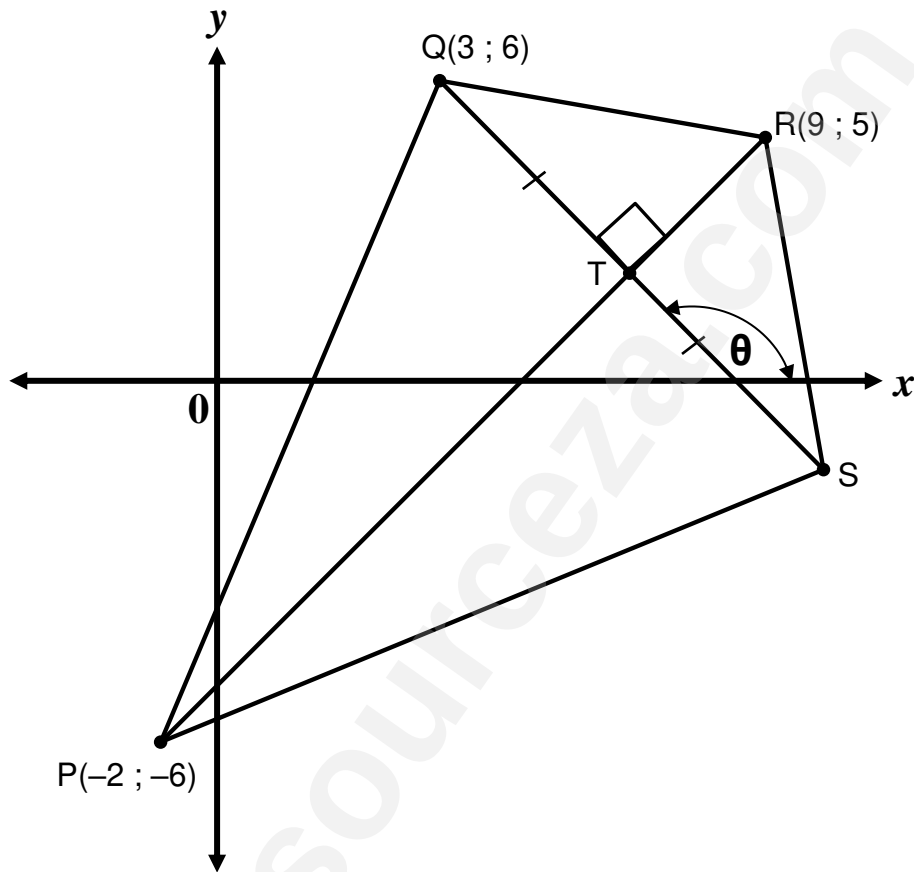
- (3) Describe the strength of the relationship between the number of visits to Dino's and Papachinos. (2)

- (4) Predict the number of visits to Papachinos when there are 25 visits to Dino's. (2)

7 MARKS

QUESTION 2

Quadrilateral PQRS, a kite, is given with $QT = TS$ and $QS \perp PR$. $P(-2; -6)$, $Q(3; 6)$, $R(9; 5)$ and S are the vertices of the quadrilateral.



- (a) Calculate the length of PR and give your answer in simplest surd form. (2)

- (b) Determine the equation of PR. (4)

- (c) Determine the equation of QS. (3)

- (d) Determine the coordinates of T. (4)

- (e) Determine the co-ordinates of S. (2)

- (f) Determine θ , the angle of inclination of line QS. (2)

17 MARKS

QUESTION 3

Do NOT use a calculator to answer this question.

(a) Evaluate, without a calculator:

$$(1) \quad \cos 69^\circ \cdot \cos 9^\circ + \cos 81^\circ \cdot \cos 21^\circ \quad (4)$$

$$(2) \quad \frac{\sin 290^\circ \cdot \tan(-45^\circ) \cdot \sin 160^\circ \cdot \sin(90^\circ + x)}{\cos(-x - 360^\circ) \cdot \cos 300^\circ \cdot \sin 140^\circ} \quad (9)$$

(b) If $\sin 25^\circ = p$, express each of the following in terms of p .

(1) $\cos 205^\circ$

(3)

(2) $\cos 50^\circ$

(2)

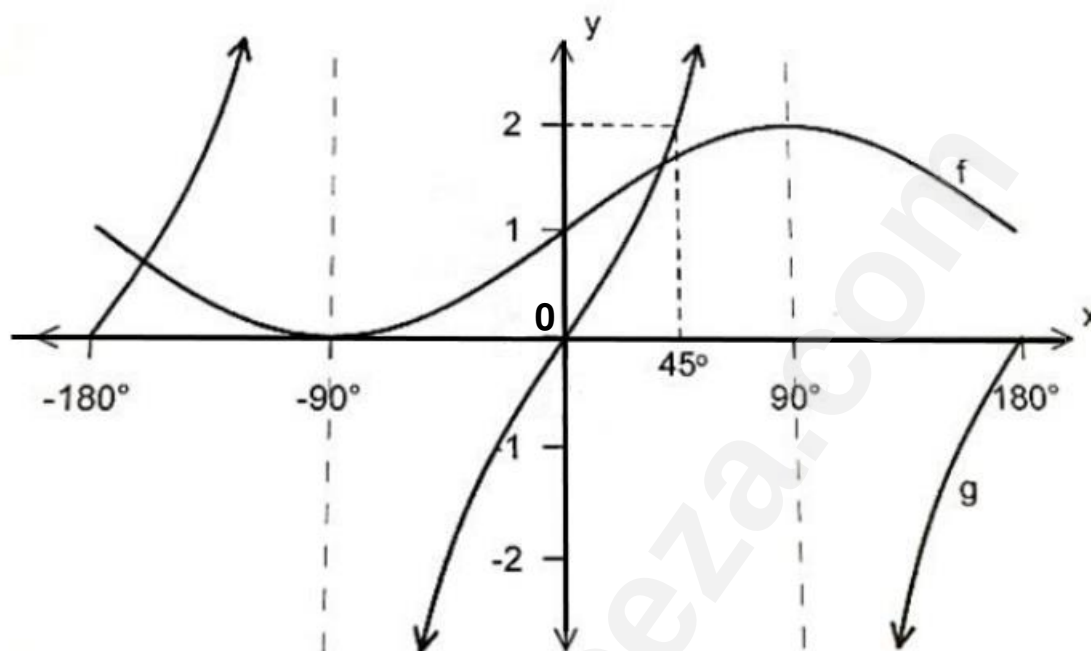
(3) $\sin 55^\circ$

(4)

22 MARKS

QUESTION 4

The graphs of $f(x) = a\sin x + q$ and $g(x) = b\tan x$ for the domain $x \in [-180^\circ; 180^\circ]$ are drawn below.



- a) Give the values of a , q and b . (3)

- b) State the period of g . (1)

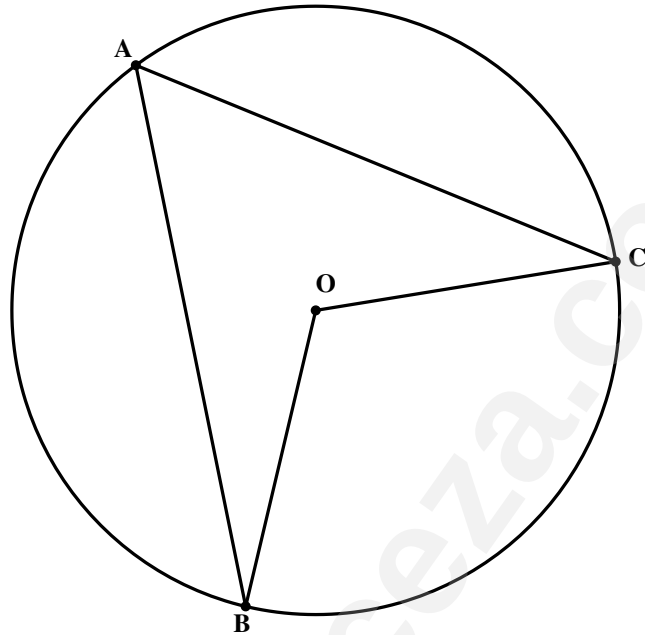
- c) For which values of x will $f'(x) > 0$, given $x \in [-180^\circ; 180^\circ]$. (2)

6 MARKS

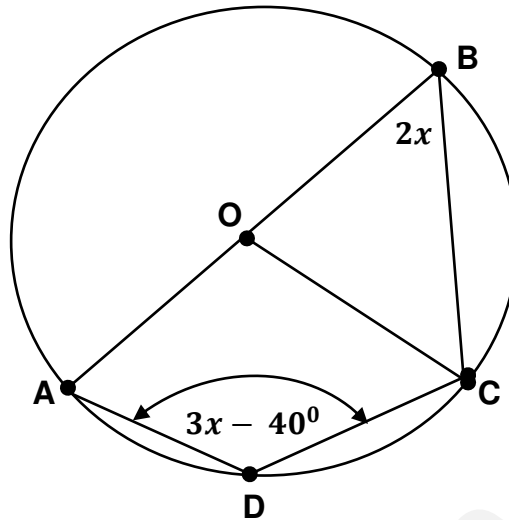
QUESTION 5

- (a) Using the diagram below, prove this theorem:

“The angle at the centre of circle O is double the angle at the circumference”. (5)

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- (b) In the diagram below, O is the centre of the circle with diameter AB.



- (1) Find the measurement of reflex $\widehat{AOC}$ in terms of x , without a reason. (1)

- (2) Find the numerical value of x . (3)

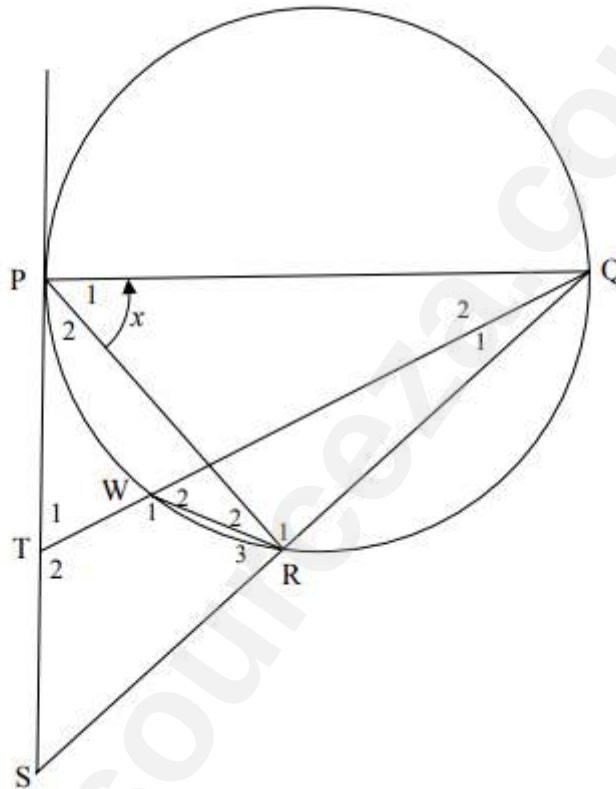
9 MARKS

QUESTION 6

In the figure below, PQ is a diameter to circle PWRQ.

SP is a tangent to the circle at P.

Let $\hat{P}_1 = x$



- a) Why is $\angle PRQ = 90^\circ$ (1)

- b) Prove that $\hat{P}_1 = \hat{S}$ (2)

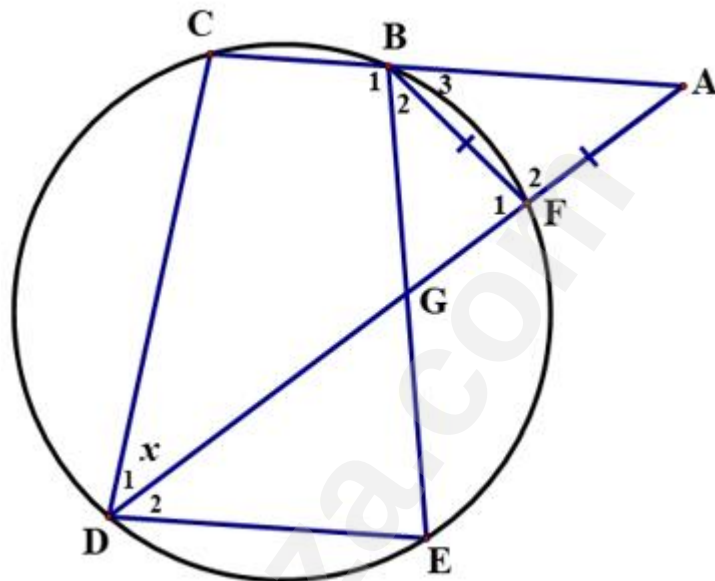
- c) Prove that SRWT is a cyclic quadrilateral. (2)

- d) Prove that $\triangle QWR \sim \triangle QST$ (3)

8 MARKS

QUESTION 7

In the diagram B, C, D, E and F lie on the circle. AD bisects $\widehat{D}$ and $AF = BF$. CB and DG produced meet at A. Let $\widehat{D}_1 = x$.



Prove that:

(a) $\widehat{B}_2 = \widehat{B}_3$ (3)

(b) $DC = AC$

(2)

(c) $\widehat{CDE} = \widehat{E}$

(3)

8 MARKS

TOTAL SECTION A : 77 MARKS

SECTION B

QUESTION 8

- (a) Which one of the following values is most influenced by extreme values :

mean ; median ; mode (1)

- (b) A school announces in its media release:
'The Grade 12 pass rate has improved by a 100% of the pass rate from last year.'
Explain why this statement is misleading. (2)

- (c) Data was collected to compare the length of time (x, in months) couples have been dating to the amount of money (y, in rands), spent when going out on a date.
The equation of regression was determined to be: $y = 165 - 6,3x$

- (1) Explain what the slope of the line tells us about the cost of an average date as the duration of the relationship increases. (2)

- (2) Can we use this line to predict the cost of a date in a 3 year long relationship?
Motivate your answer. (2)

7 MARKS

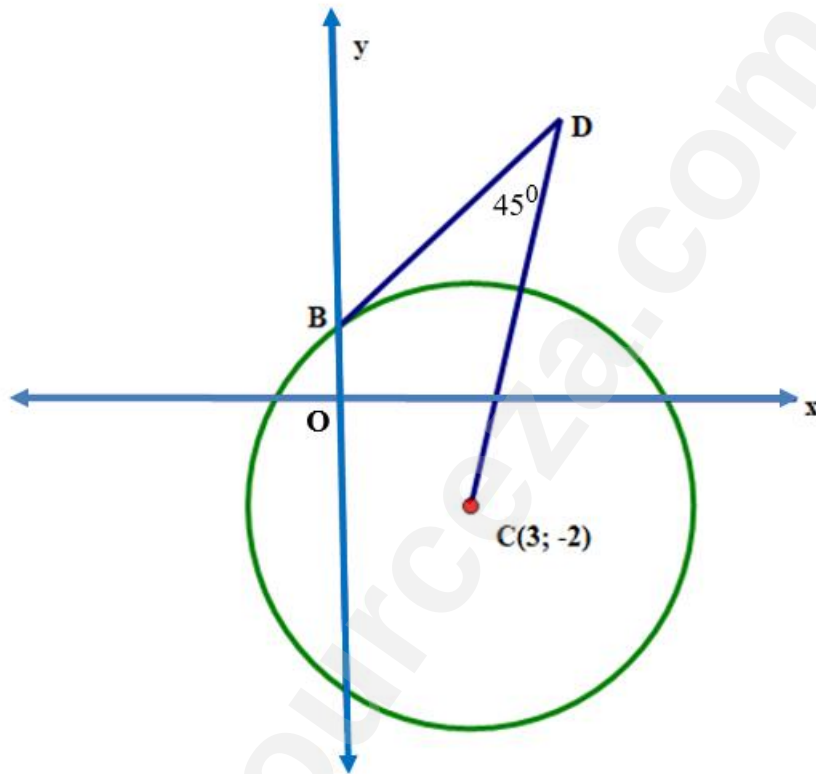
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QUESTION 9

In the diagram below, BD is a tangent to a circle at point B, which lies on the y -axis.

The centre is $C(3; -2)$. The equation of the tangent BD is given by $3x - 4y + 8 = 0$.

$$\widehat{BDC} = 45^\circ$$



- (a) Determine the coordinates of B. (1)

- (b) Show that the equation of the circle is $x^2 - 6x + y^2 + 4y - 12 = 0$ (4)

- (c) Find the equations of two tangents to the circle which are parallel to the y -axis. (2)

- (d) Determine the coordinates of D. (6)

[illegible]

13 MARKS

QUESTION 10

Given : $(x - 7)^2 + (y + 2)^2 = 49$ and $x^2 + y^2 + 8x + 4y - 38 = 0$.

Using appropriate calculations, determine if the circles intersect.

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6 MARKS

QUESTION 11

- (a) Determine the general solution of the following equation:

$$\cos 6x = \sin 5x \cdot \cos x - \cos 5x \cdot \sin x \quad (6)$$

[illegible]

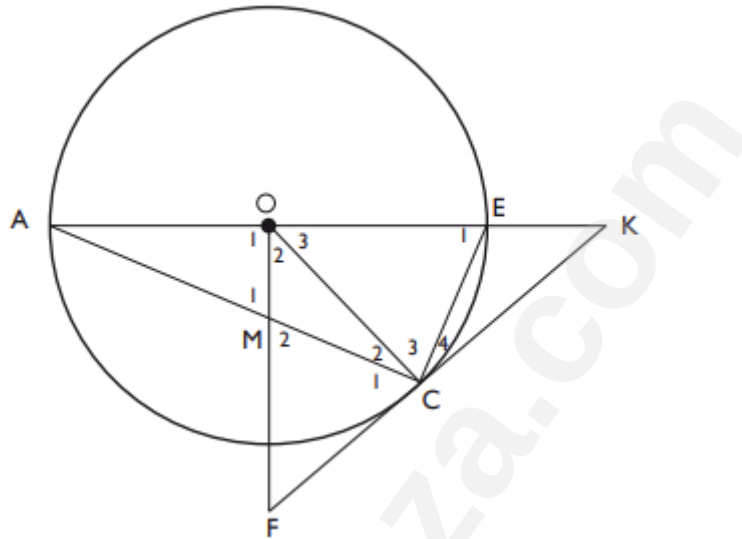
(b) Prove the following identity:

$$\frac{2 - \cos^2 \beta - 2 \sin \beta}{\cos^2 \beta} = \frac{1 - \sin \beta}{1 + \sin \beta} \quad (5)$$

11 MARKS

QUESTION 12

FK is a tangent to the circle centre O.

$$FO \perp AK$$


Prove that:

(a) $\Delta AOM \parallel \Delta ACE$

(4)

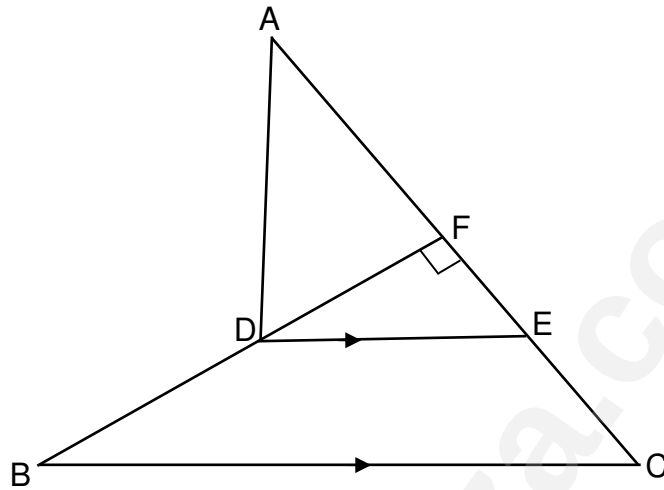
[illegible]

(b) $2AO^2 = AM.AC$ (3)

(c) $KC^2 = AK.KE$ (6)

13 MARKS

In the diagram below, F is the midpoint on AC with $BF \perp AC$. $DE \parallel BC$ with B on FD produced. $DF = 6$ cm with $DF:BF = 1:3$ and $EC = \frac{3}{2} DF$.



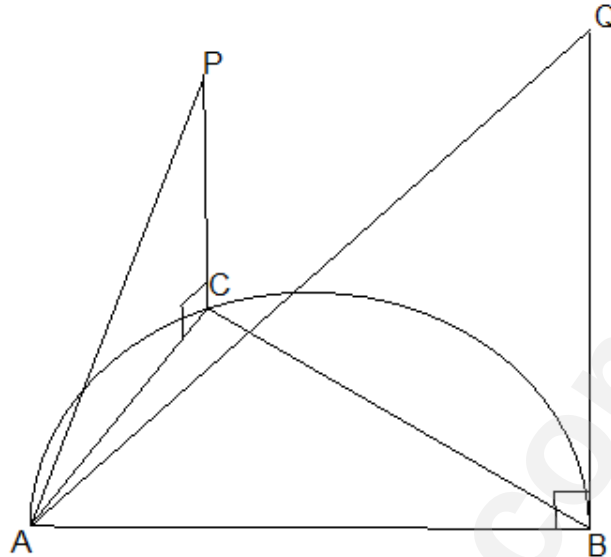
- (a) Calculate the length of FE. (5)

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- (b) Calculate $\frac{\text{Area of } \triangle EDF}{\text{Area of } \triangle ADE}$ (5)

10 MARKS

QUESTION 14



AB is the diameter of a semi-circle lake.

Two perpendicular towers have been built on the banks (CP and BQ).

From A the angles of elevation of P and Q are α and β respectively. $\angle CAB = \theta$.

- (a) Determine CA in terms of CP and α . (2)

- (b) Determine BQ in terms of AB and β . (1)

- (c) Prove that $BQ = \frac{CP \tan \beta}{\tan \alpha \cos \theta}$. (5)

[illegible]

- (d) If the point C moves along the semi-circle such that it co-incides with the point B and $\beta = 45^\circ$ and $\alpha = 30^\circ$ determine the value of $\frac{QB}{PC}$. (5)

This image shows a blank sheet of white paper with horizontal blue or grey ruling lines, typical of notebook paper. The lines are evenly spaced and run across the width of the page. A faint, diagonal watermark reading "edureso" is visible across the center of the page.

13 MARKS

TOTAL SECTION B : 73 MARKS

ADDITIONAL SPACE FOR WORKING

This section provides a large area for working, consisting of 25 horizontal lines. A diagonal watermark reading 'eduresourceza.com' is overlaid across the center of this area.

